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(71) Applicant(s)

Luk Lamellen und Kupplungsbau GmbH
(Incorporated in the Federal Republic of Germany)
Patentabteilung, Industriestrasse 3, 77815 Bühl,
Baden, Federal Republic of Germany

(72) Inventor(s)

Jürgen Osterlänger
Roland Walter
Gerhard Prosch
Peter Giese

(74) Agent and/or Address for Service

Dummett Copp
25 The Square, Martlesham Heath, IPSWICH, Suffolk,
IP6 3SL, United Kingdom

(54) Abstract Title

Vibration damping device in a hydraulic circuit operating a clutch

(57) A damping device is connected in a pressure line between a clutch slave cylinder and a clutch master cylinder and comprises a single or two piece housing 1a containing a sealed piston 13 biased by a coil or plate spring 12. Vibrations transmitted from an internal combustion engine to the hydraulic circuit are damped by the piston 13 moving against the spring 12 so as to expand the volume in the housing 1a. The plate springs 12 may be arranged in alternate directions and/or the same direction so as to influence the damping characteristics of the device. In the two piece housing there is a socket part (22a, fig 2), which may contain a throttle valve, and a push-in part (23a) that engage with each other by means of a keyed connection held together by a sleeve (24a). The piston in the one piece housing 1a is contained in a section that is off-set relative to an inlet and outlet. Many other embodiments are disclosed including damping devices that use membranes that flex to accommodate the vibrations.

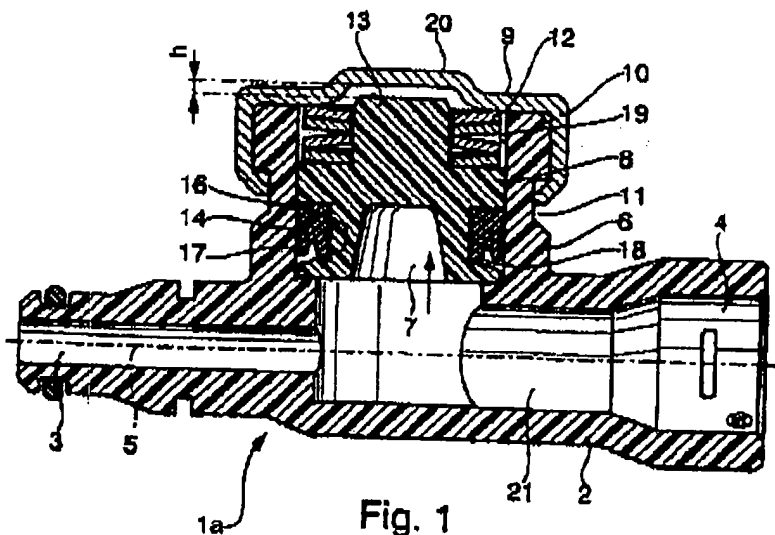
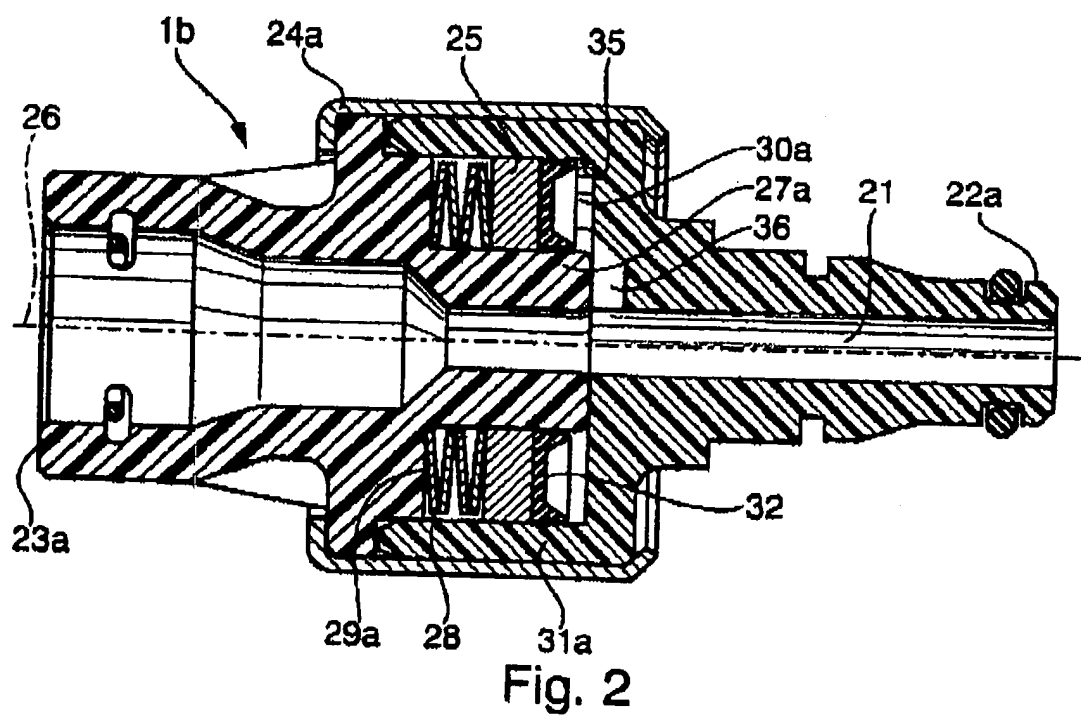
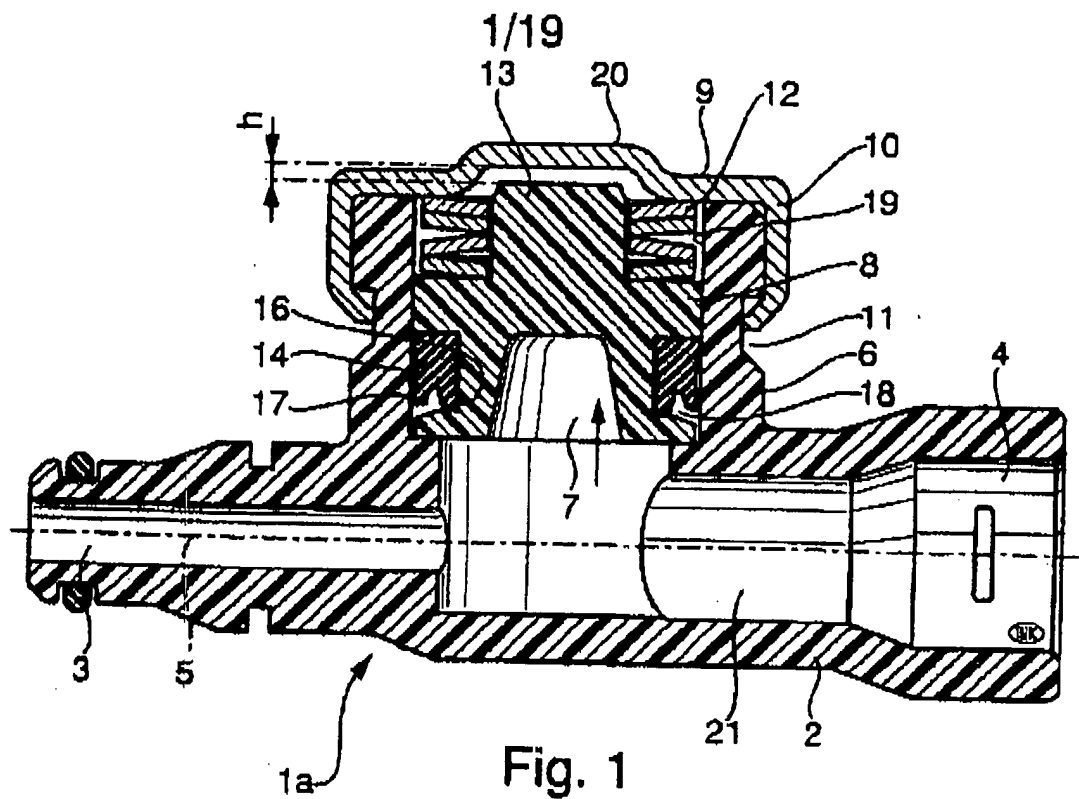


Fig. 1

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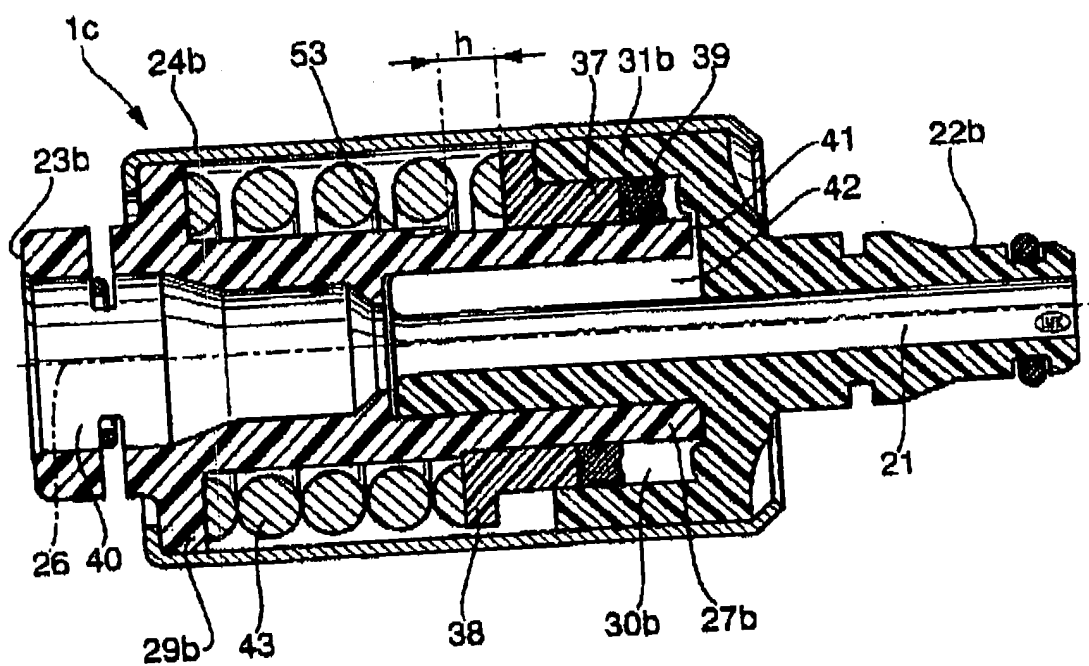


Fig. 3

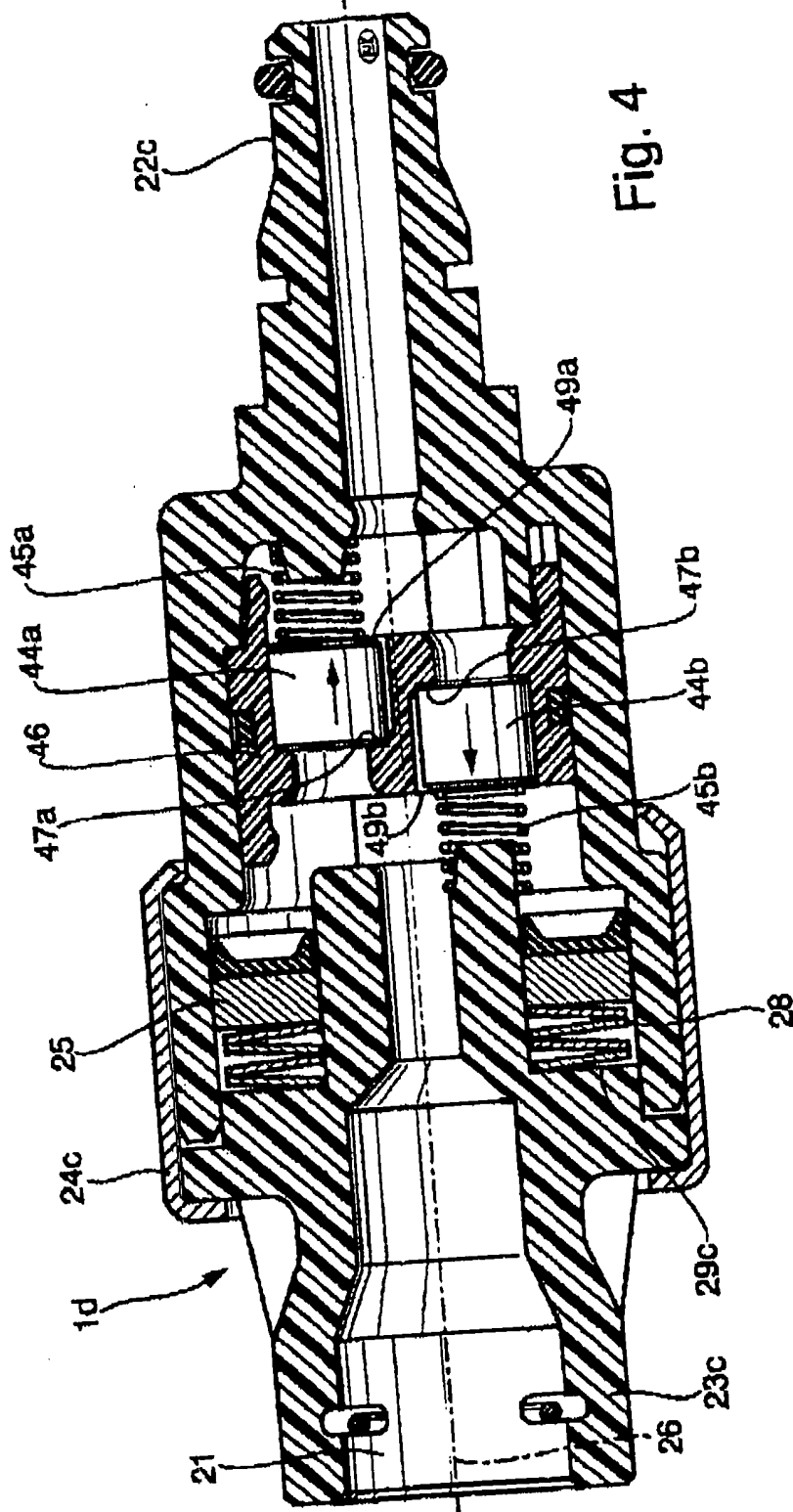


Fig. 4

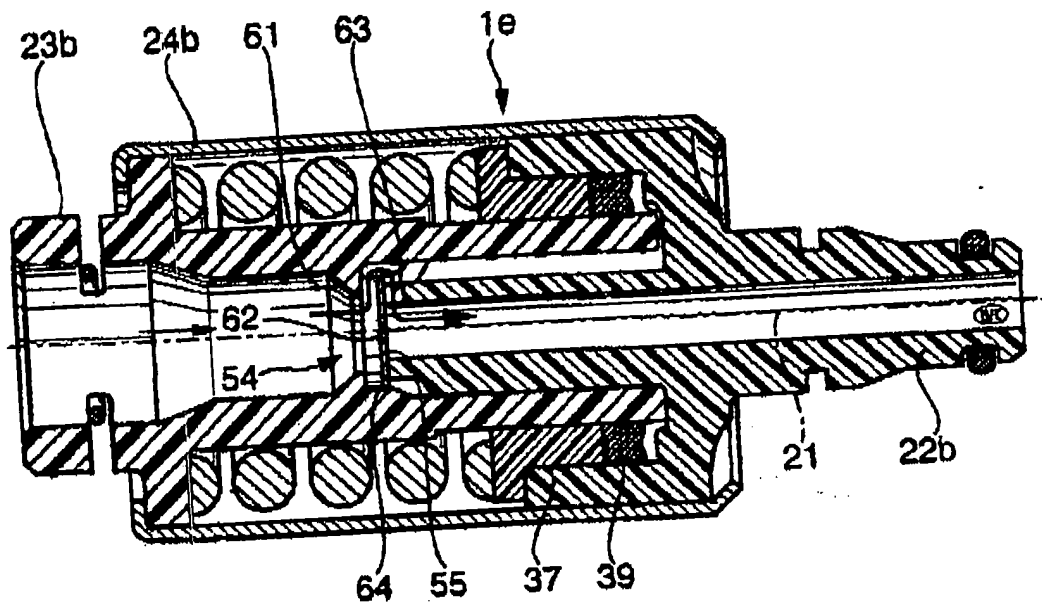


Fig. 5

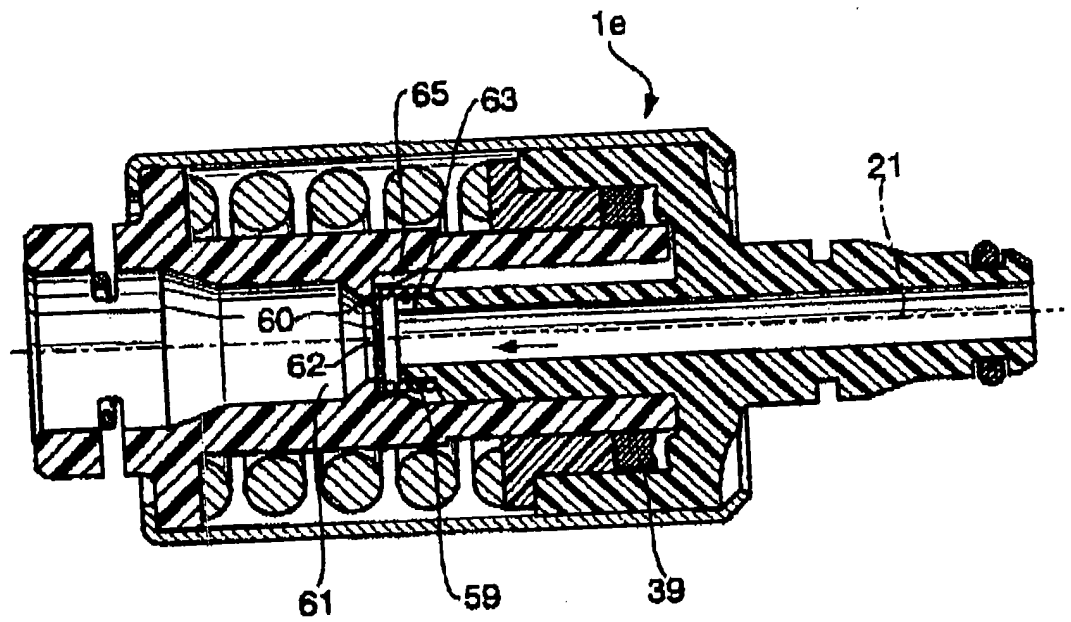


Fig. 6

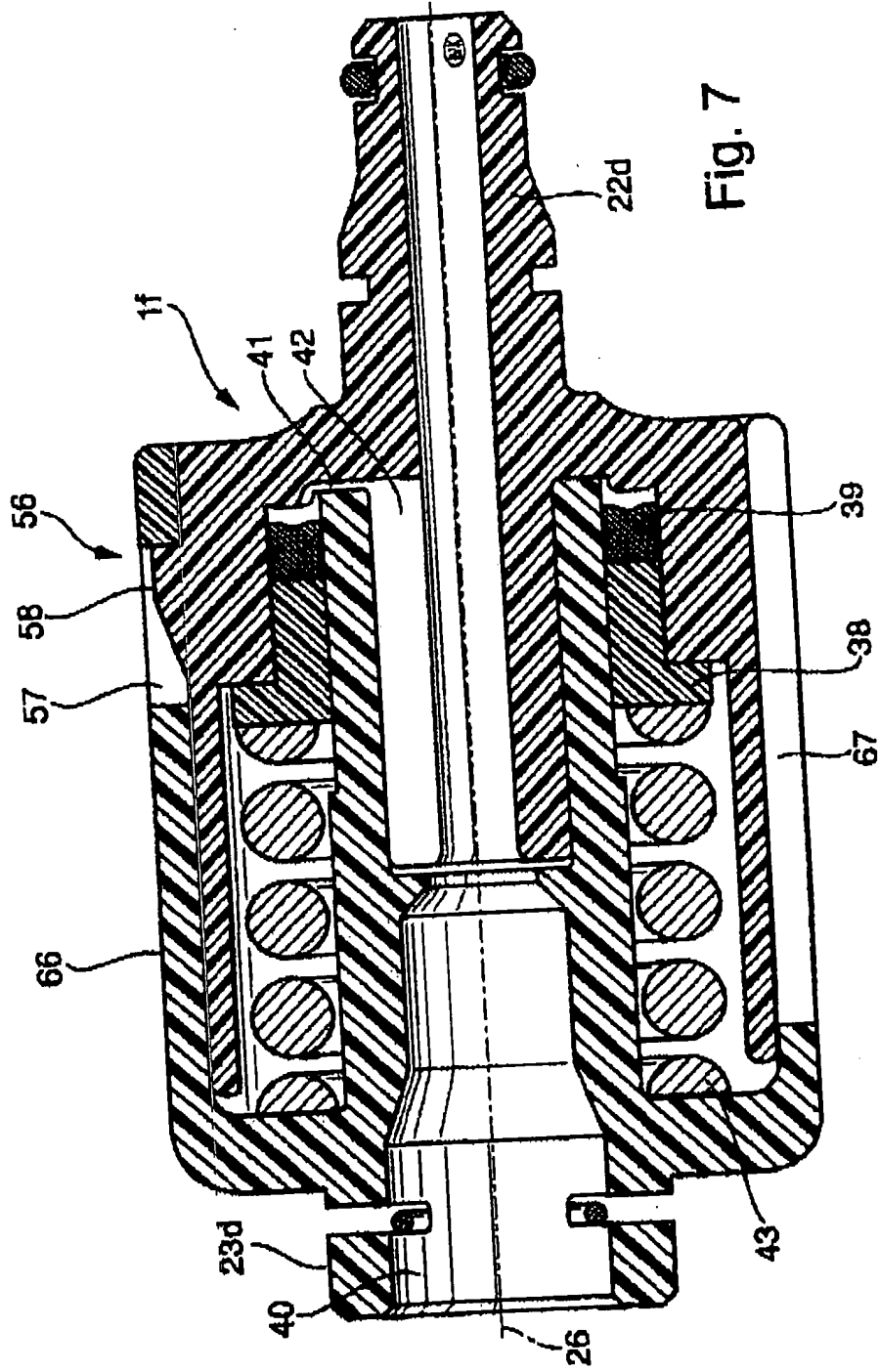


Fig. 7

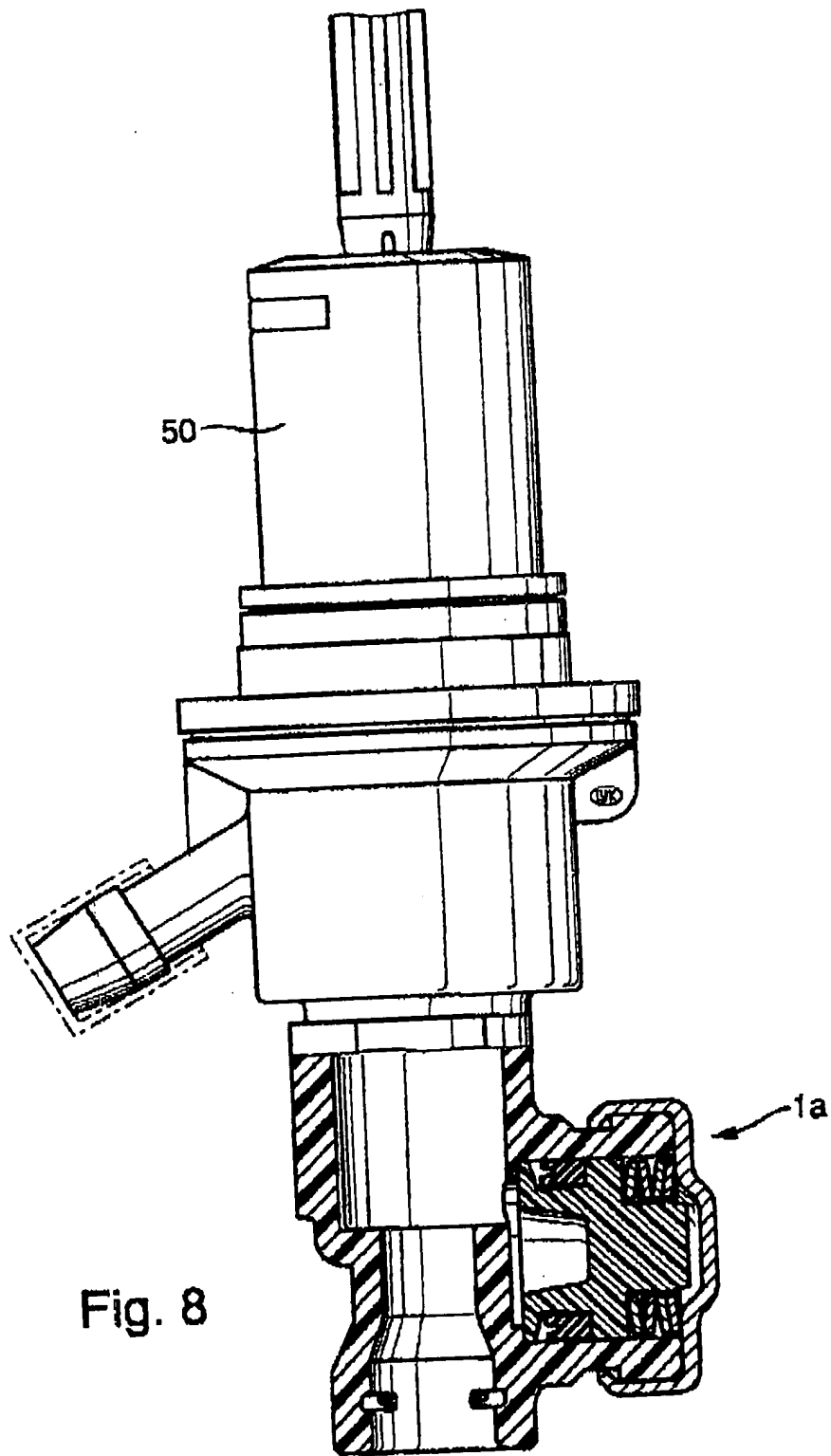


Fig. 8

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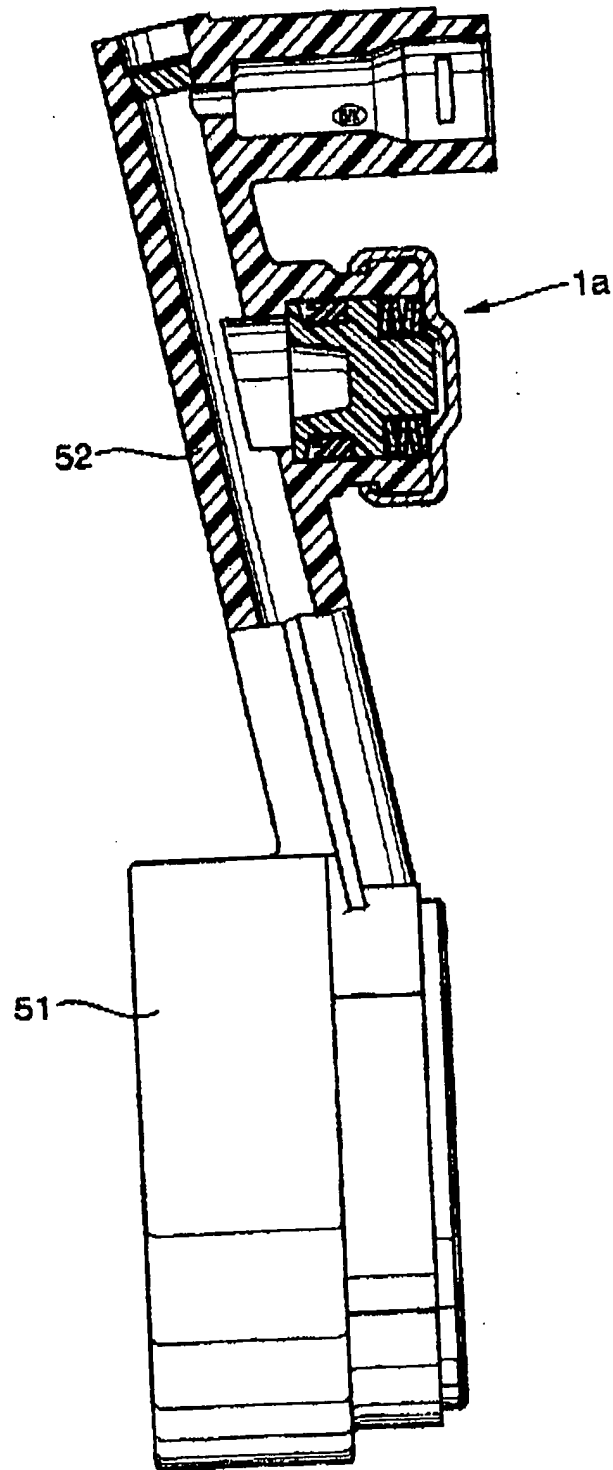


Fig. 9

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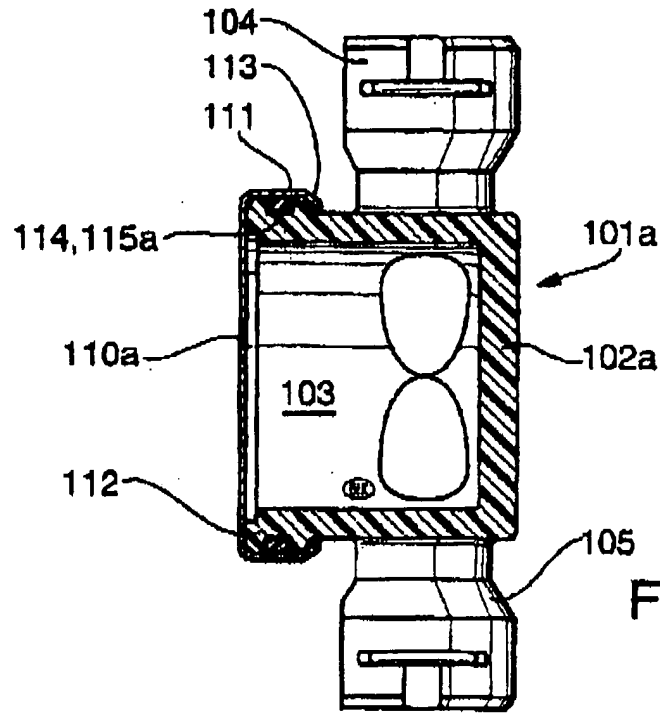


Fig. 10

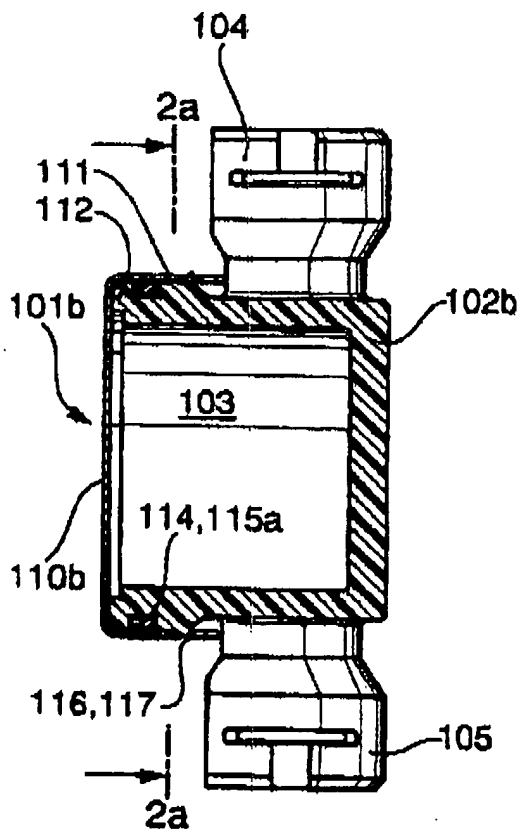


Fig. 11

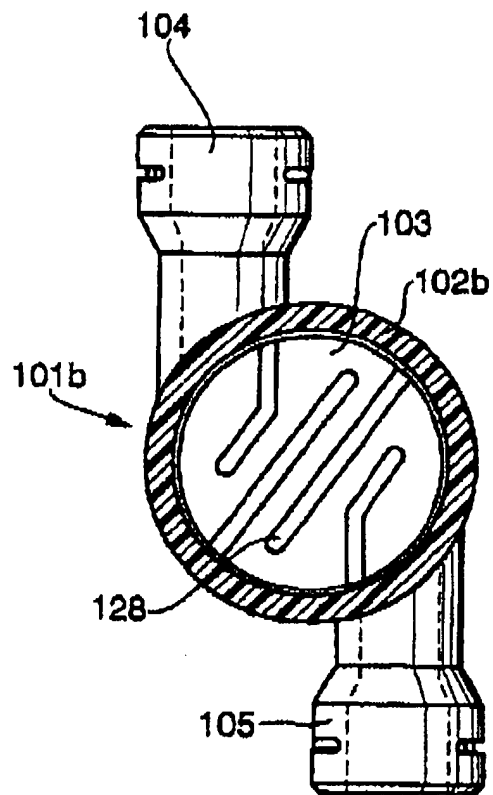


Fig. 11a

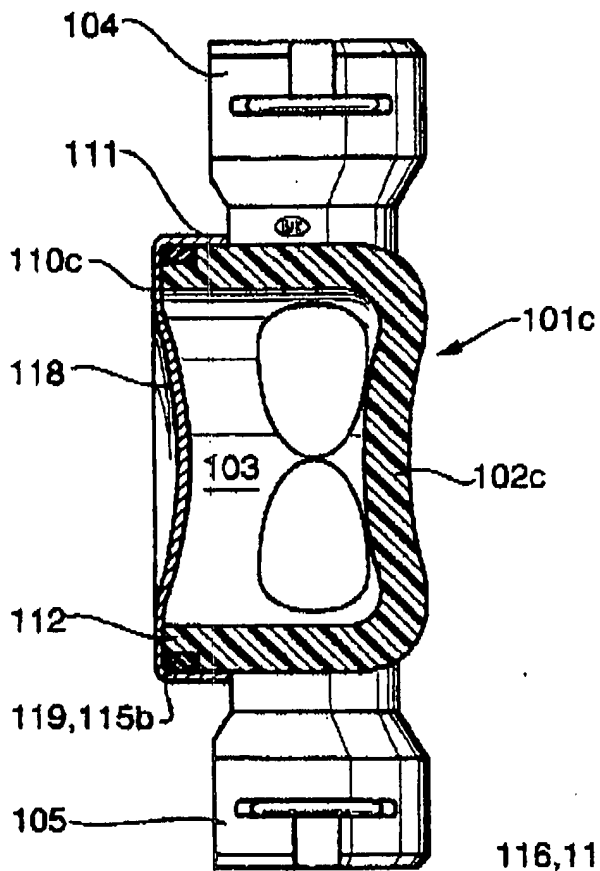


Fig. 12

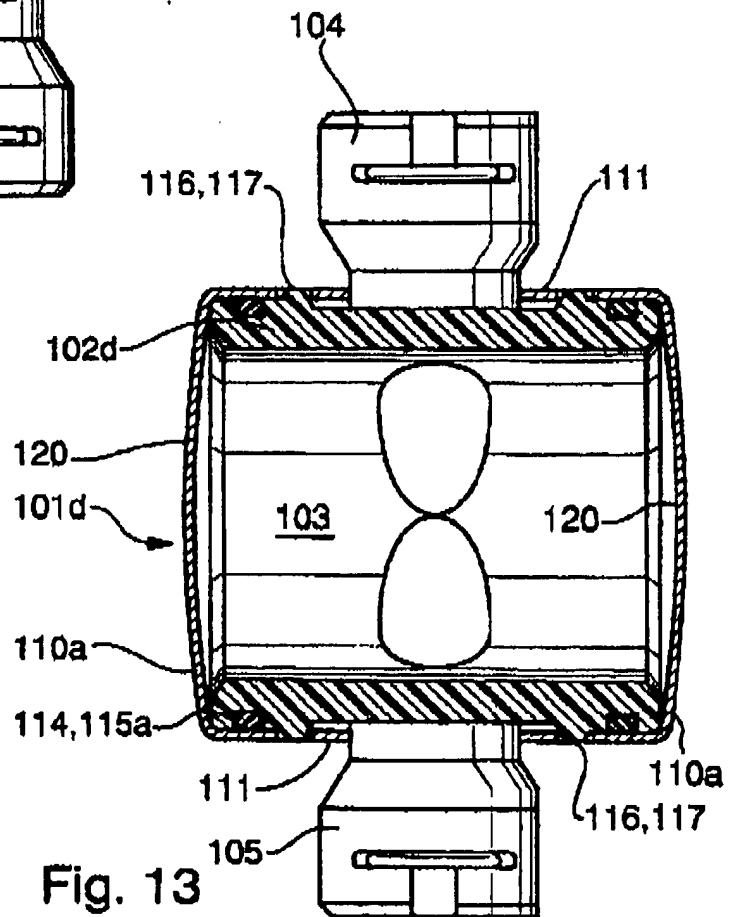


Fig. 13

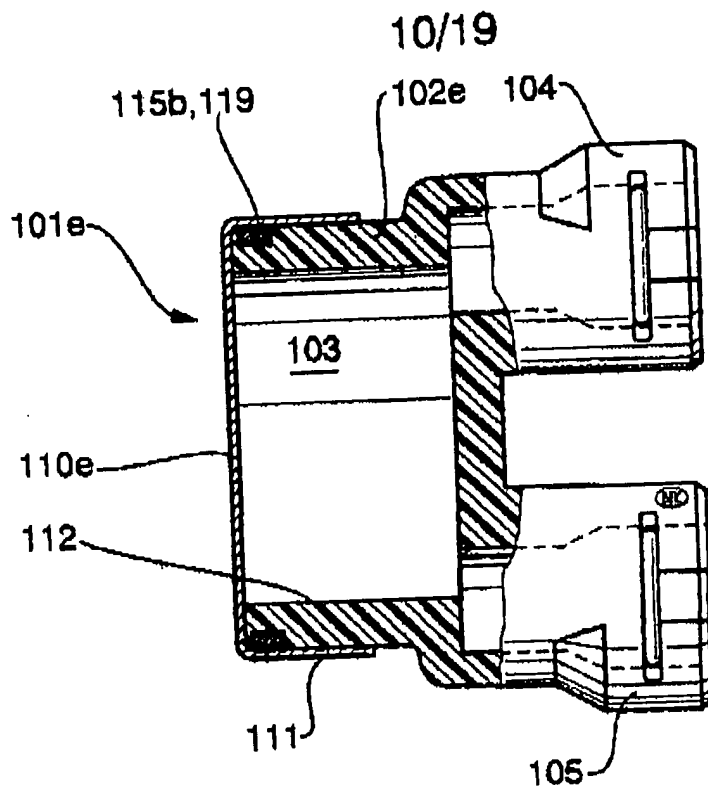


Fig. 14

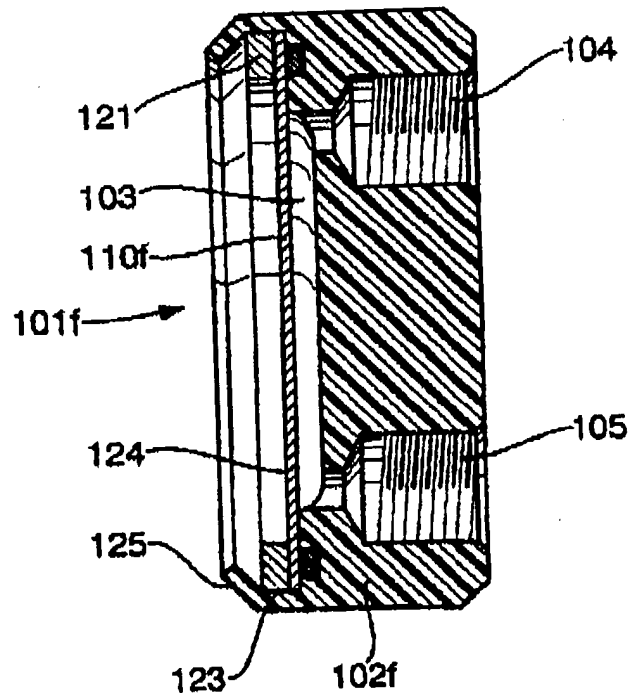


Fig. 15

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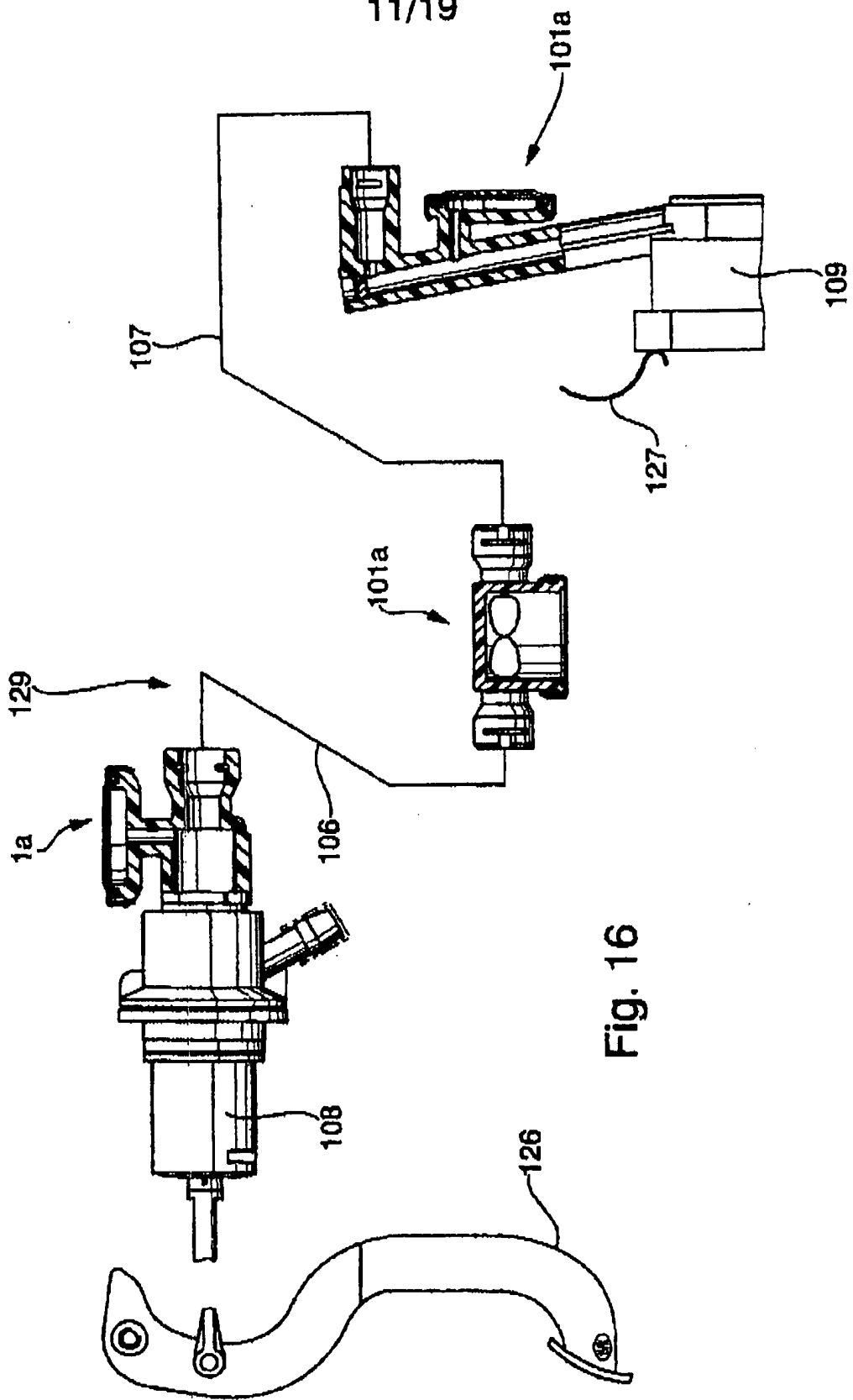


Fig. 16

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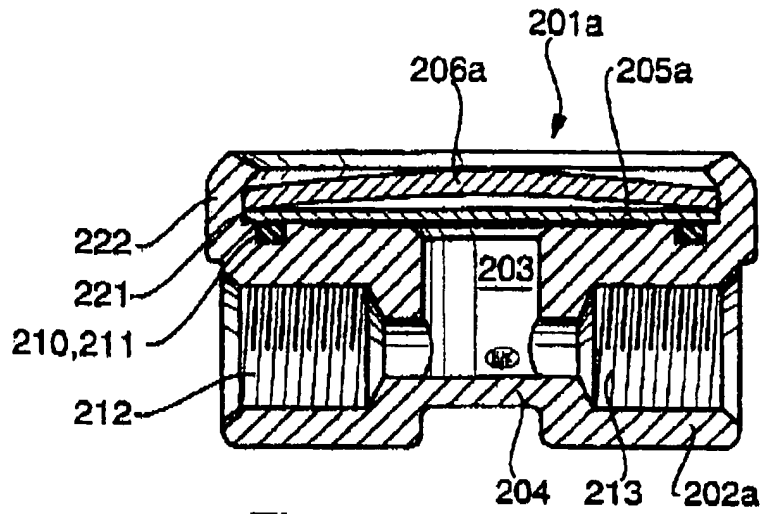


Fig. 17

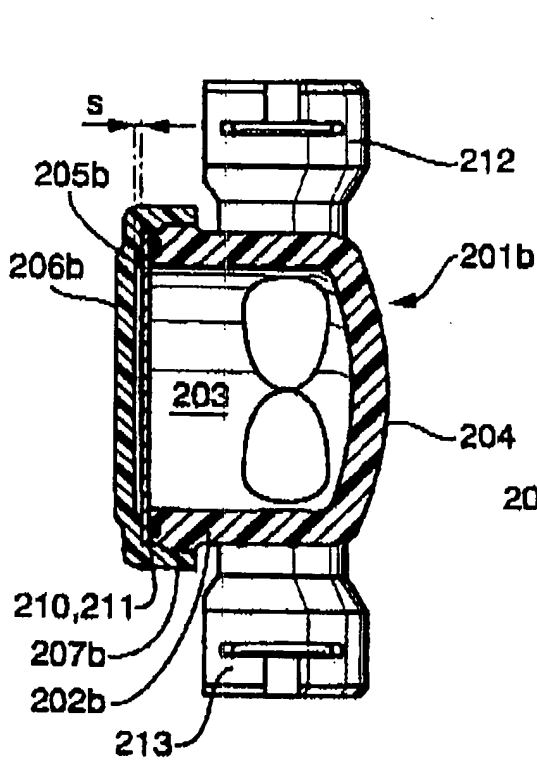


Fig. 18

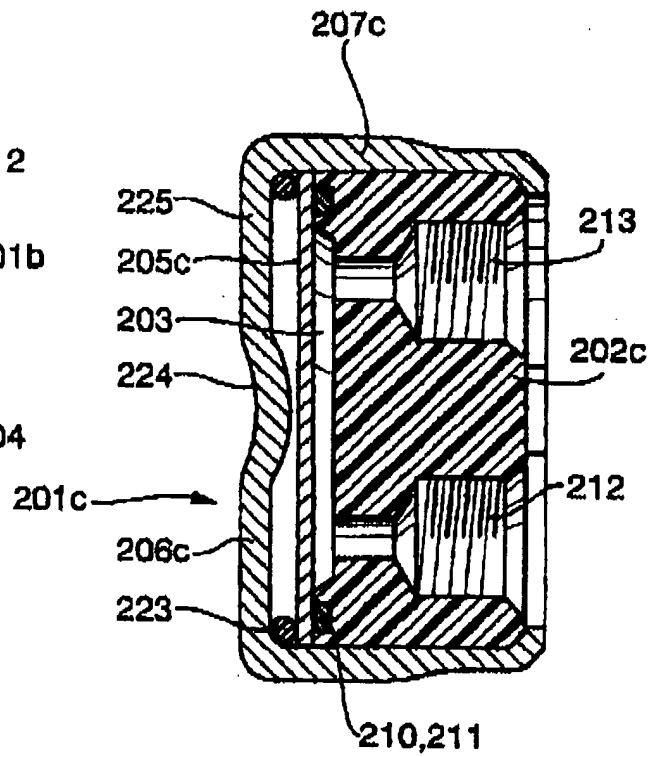


Fig. 19

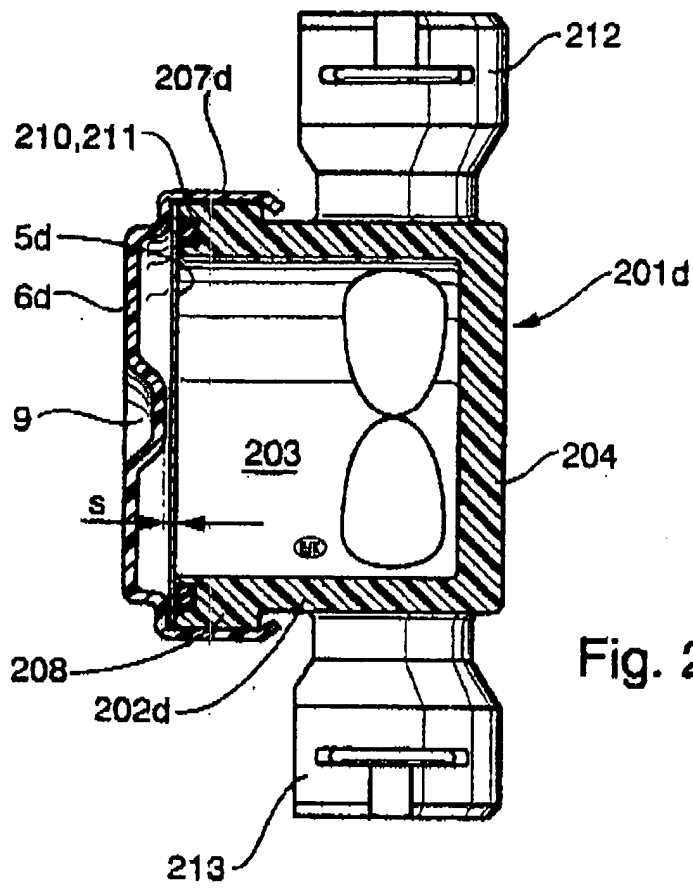


Fig. 20

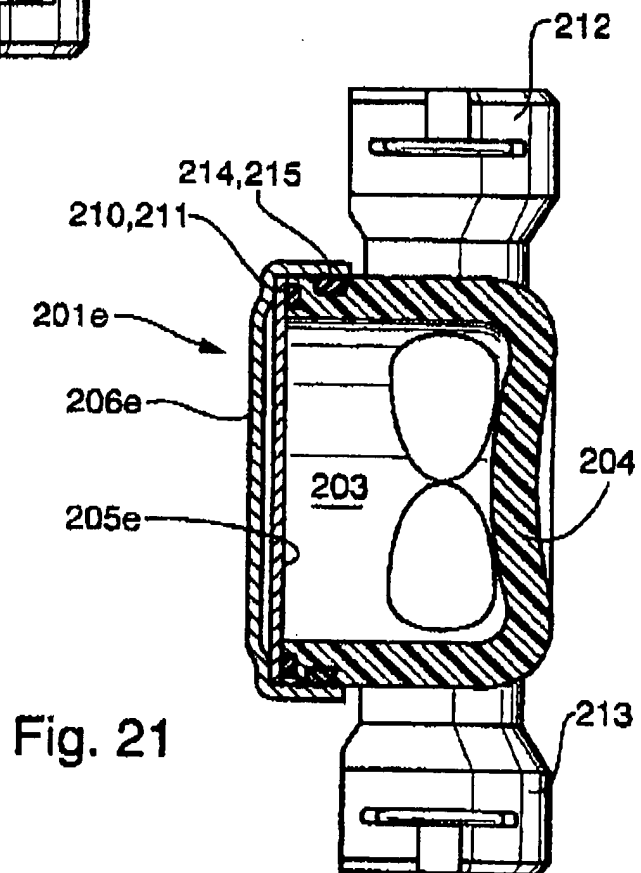


Fig. 21

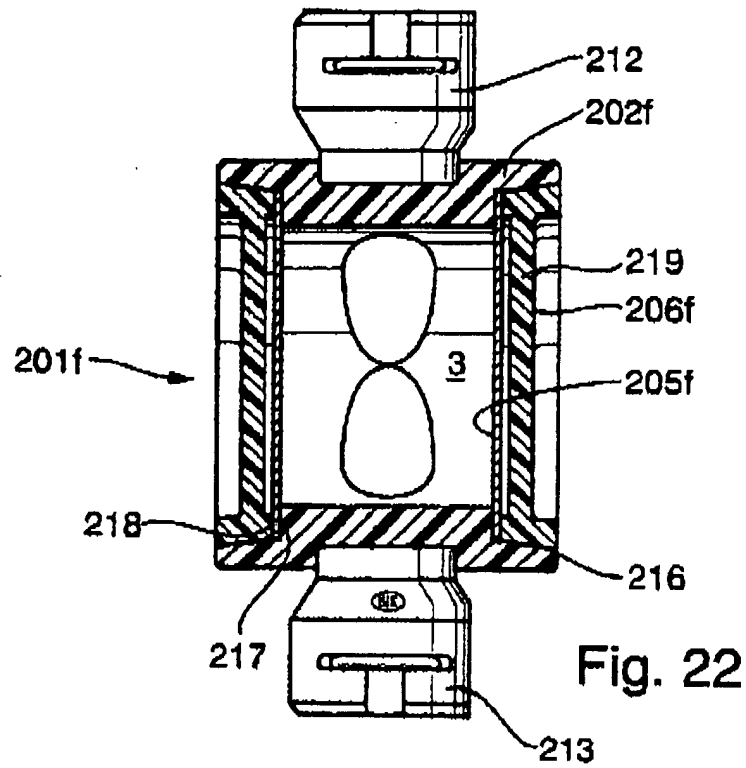


Fig. 22

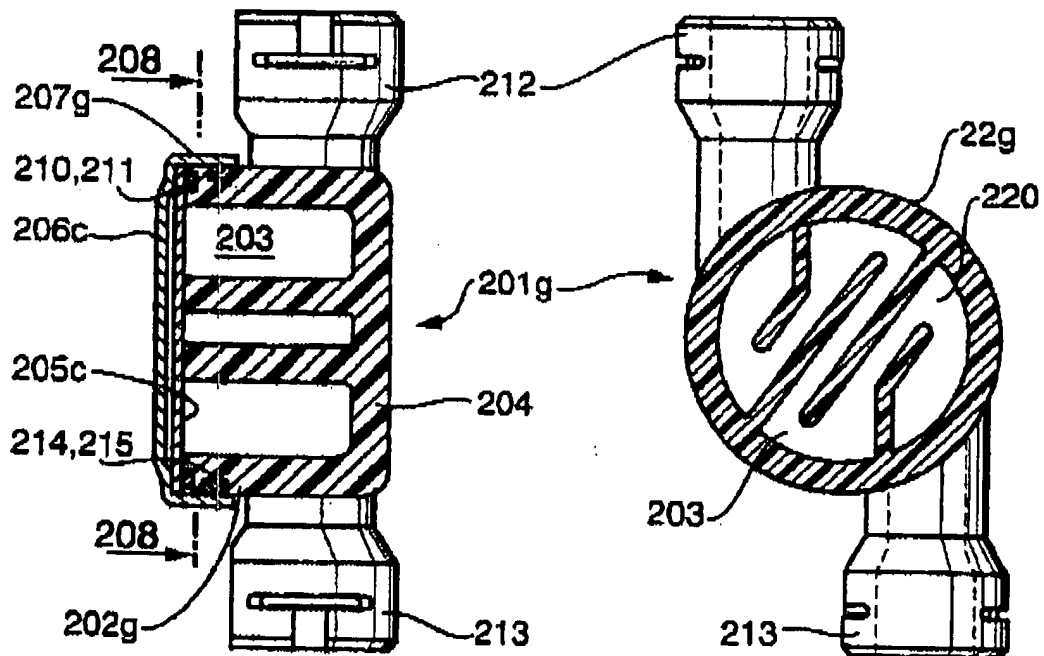


Fig. 23

Fig. 24

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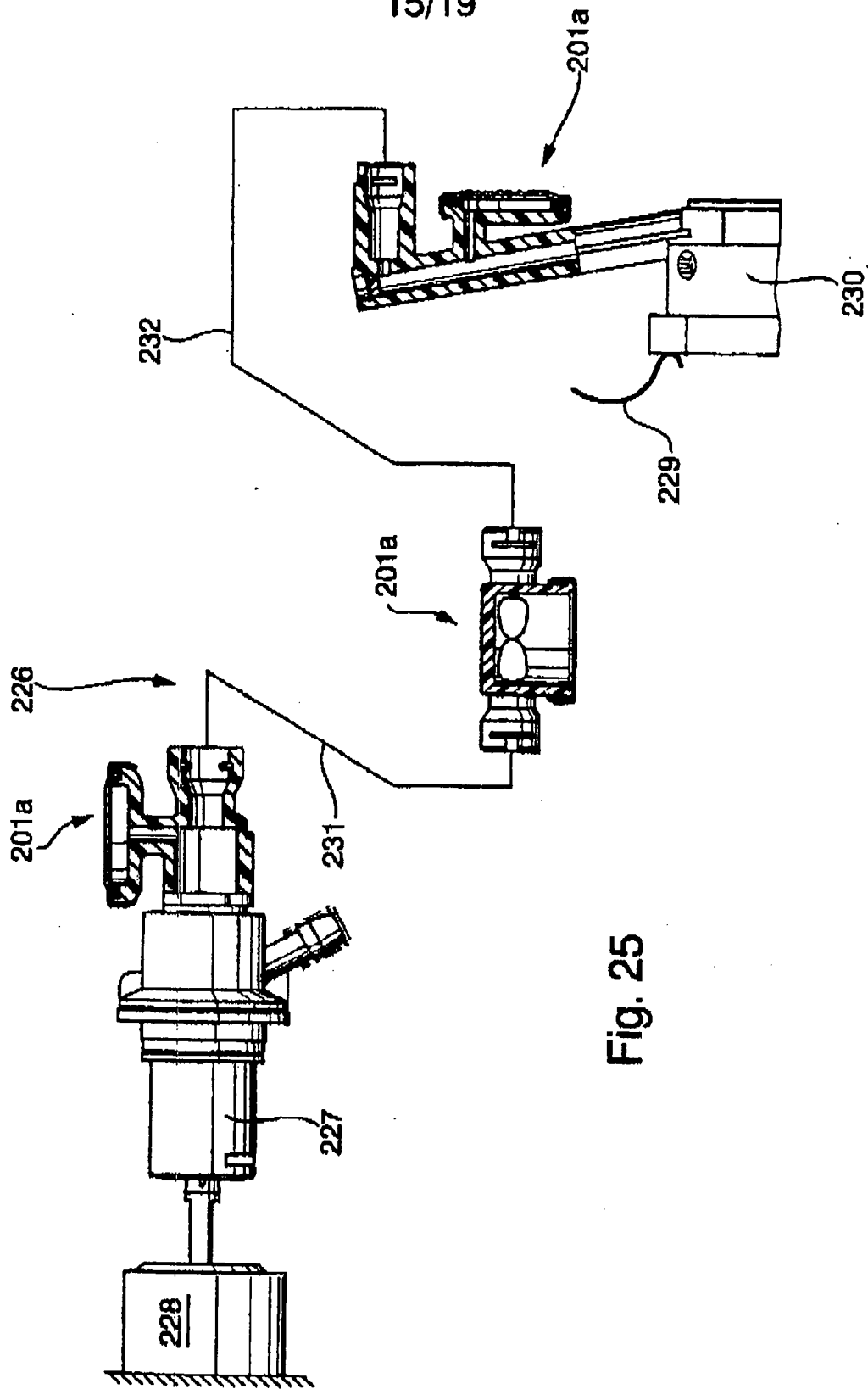


Fig. 25

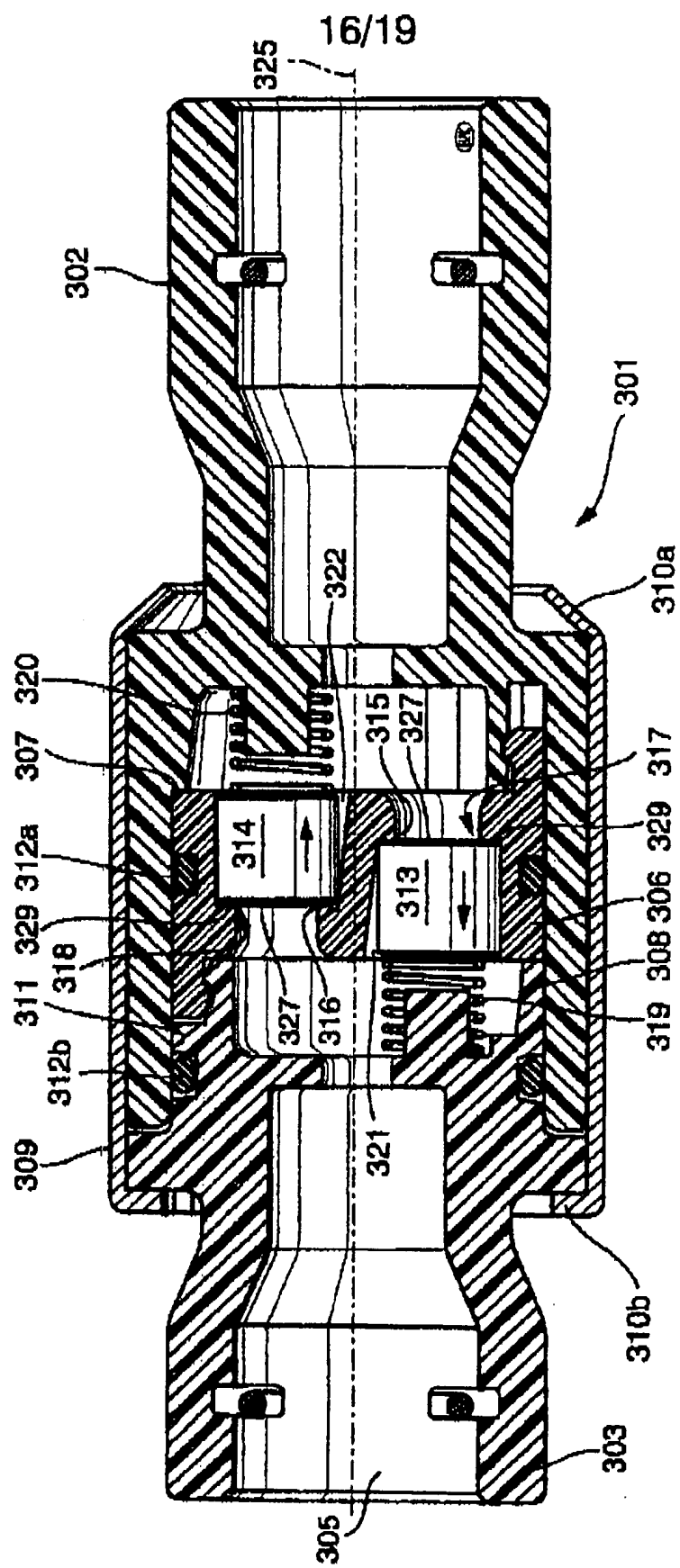


Fig. 26

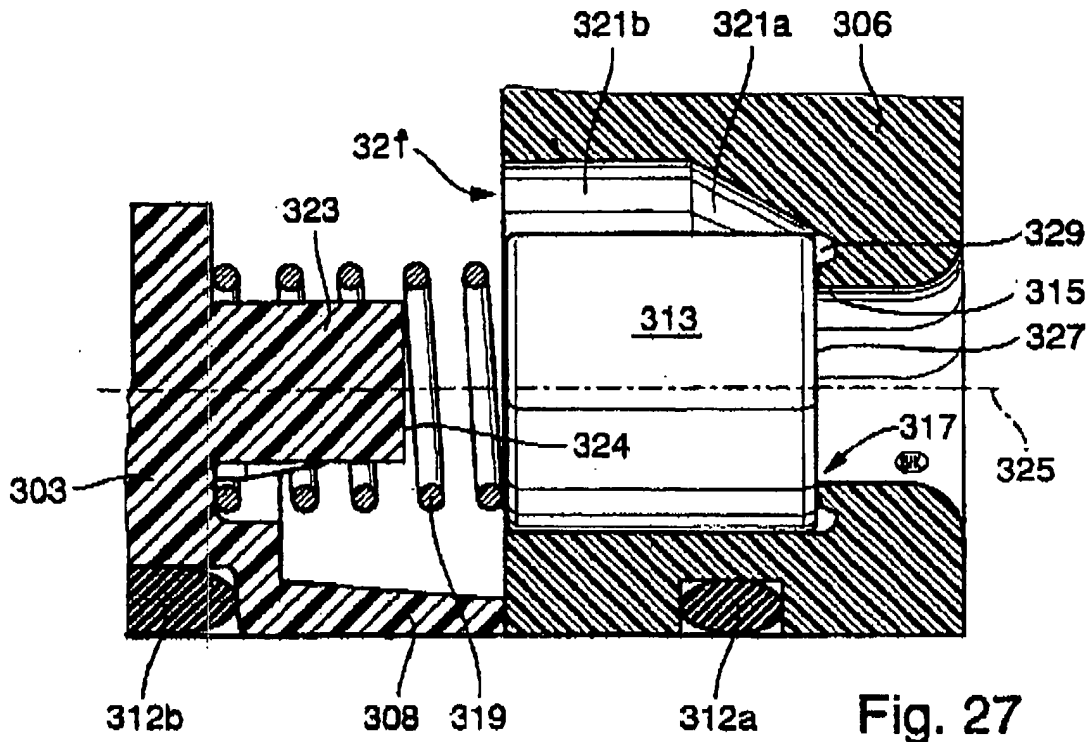


Fig. 27

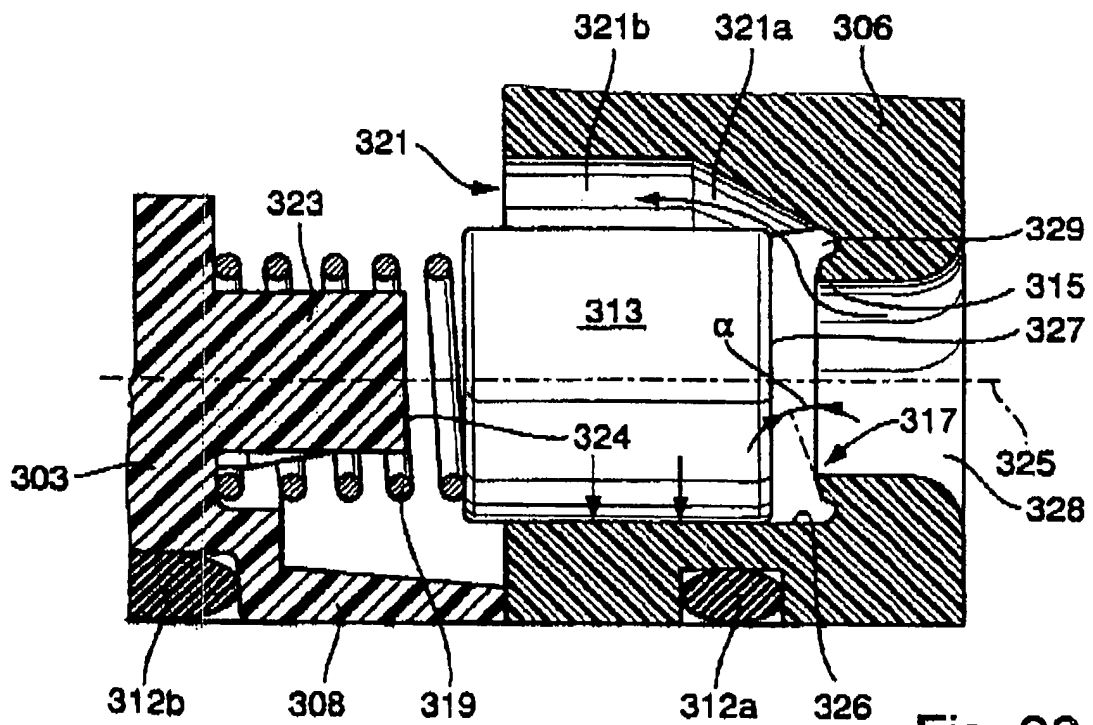


Fig. 28

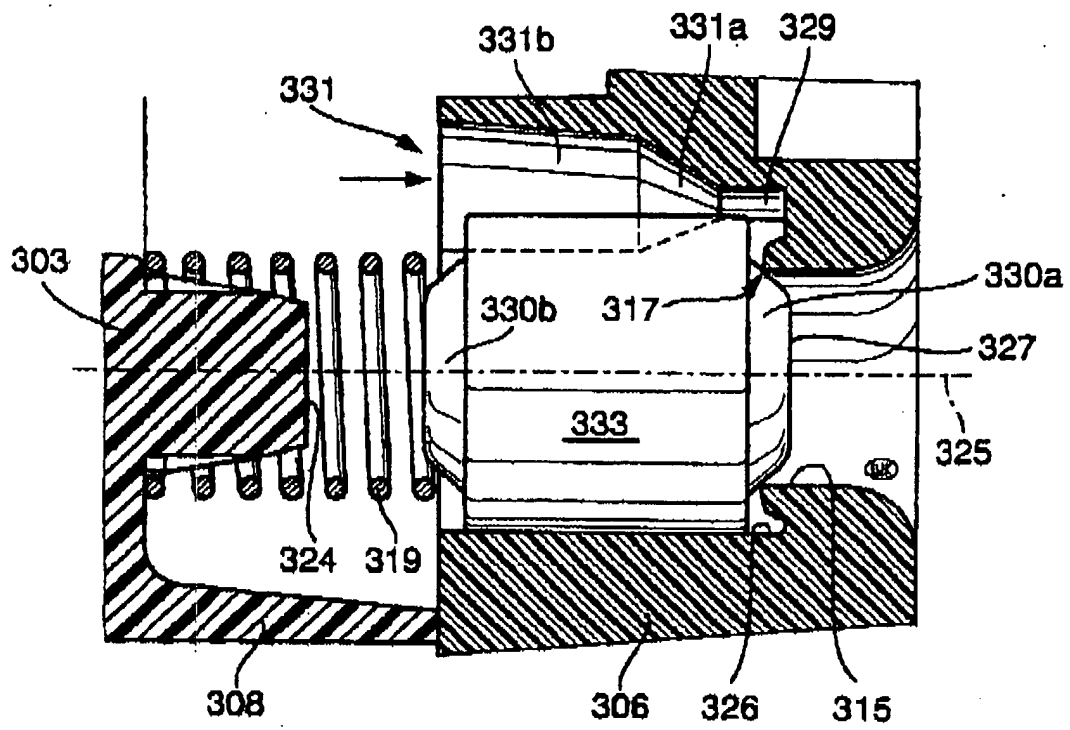


Fig. 29

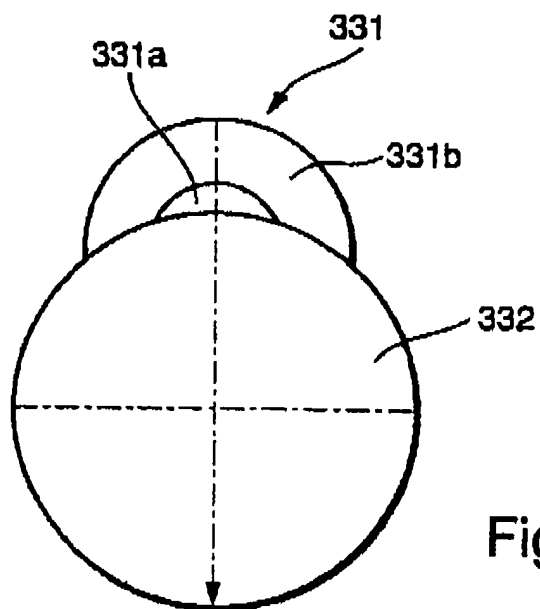


Fig. 30

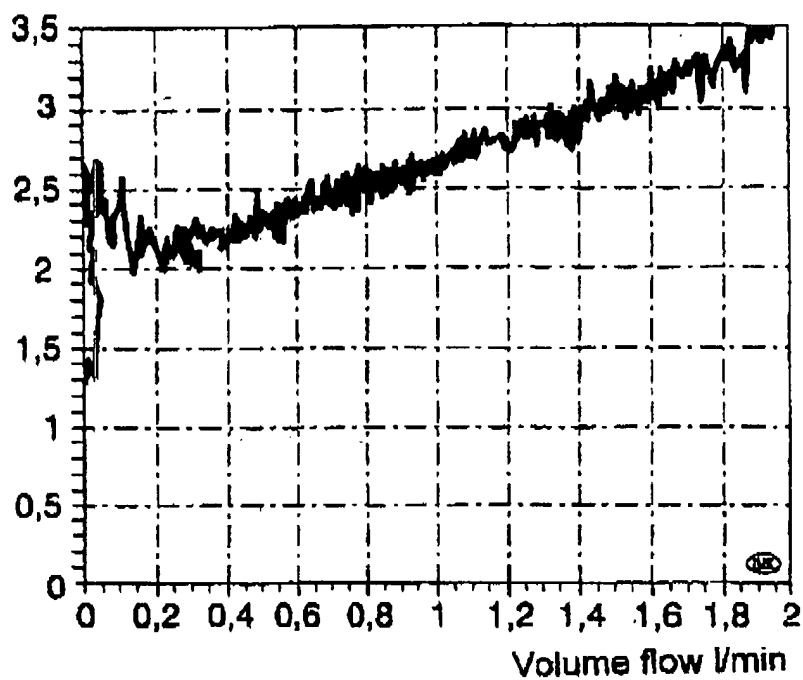


Fig. 31

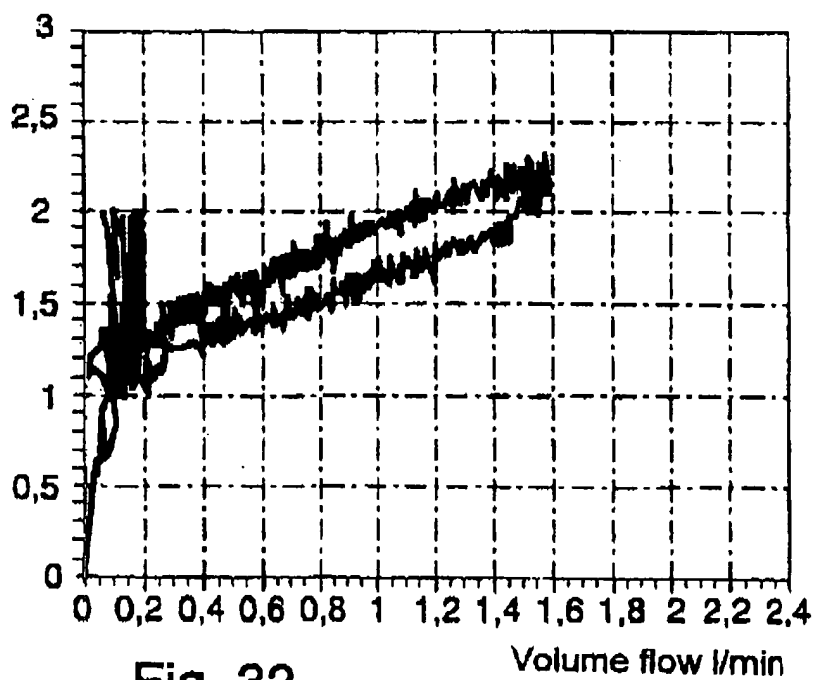


Fig. 32

Patent Claims

1. Damping device, more particularly for damping pressure vibrations and/or pressure pulsations in a hydraulic operating system having at least one master and one slave cylinder and a pressure line connecting same wherein the damping device which is connected to a component part of the operating system and is loaded by a pressurised fluid comprises an at least one-piece housing characterised in that the volume of the housing can be expanded against the action of an energy accumulator.

2. Damping device, with which pressure vibrations or pressure pulsations in a hydraulic operating system for a shift and separate clutch in vehicles are dampened or eliminated, wherein the operating system comprises by way of example a manually operable clutch pedal which interacts with a master cylinder wherein the latter is connected through a pressure line to a slave cylinder acting on a release bearing of the shift and separate clutch, and the damping device which is connected to a component part of the operating system and can be loaded by a pressurised fluid comprises a housing which is in one piece or consists of at least two component parts wherein a closure body is inserted displaceable in the installation chamber of the housing, characterised in that the sealed closure body which is supported on a spring element is biased directly or indirectly by the pressurised fluid.

3. Device more particularly according to claim 1 and/or 2 characterised in that a damping characteristic of the damping device can be influenced by a geometric design of the closure body as well as by the design of

22. Device more particularly according to one of the preceding claims characterised by a spring with which the first throttle valve is pretensioned in the
5 direction of a throttle position.

23. Device more particularly according to one of the preceding claims characterised in that the damping device is inserted in the pressure line which connects
10 the master cylinder to the slave cylinder.

24. Device more particularly according to one of the preceding claims characterised in that the damping device is combined with a master cylinder.
15

25. Device more particularly according to one of the preceding claims characterised in that the damping device is integrated in the slave cylinder directly or in the pressure pipe thereof.
20

26. Device more particularly according to one of the preceding claims characterised in that the damping device has two devices off-set from each other and with different damping characteristics.
25

27. Device for damping pressure vibrations in hydraulic systems, more particularly a hydraulic operating system for a shift and separate clutch for vehicles, provided with a master cylinder which is to
30 be operated and which is connected through a pressure line to a slave cylinder which activates the shift and separate clutch, wherein the pressure line or any component part of the hydraulic operating system is connected to a damping member whose housing has a
35 membrane which can be biased by a pressurised fluid,

characterised in that the membrane is formed as a cover fixed with keyed engagement on the housing made from plastics to thereby sealingly close the housing chamber.

5

28. Device more particularly according to one of the preceding claims characterised in that the pot-shaped membrane engages by a collar round a cylindrical shoulder of the housing.

10

29. Device more particularly according to one of the preceding claims characterised in that an end section of the collar engages behind the shoulder of the housing by flanged areas.

15

30. Device more particularly according to one of the preceding claims characterised in that the membrane is fixed by a snap-fit connection mounted between the collar and the housing.

20

31. Device more particularly according to one of the preceding claims characterised in that in order to seal the membrane a sealing ring is inserted in a circumferential groove or in a recess of the housing and in the installation position of the sealing ring is covered by the collar of the membrane.

25

32. Device more particularly according to one of the preceding claims characterised by a housing which is provided with two diametrically opposite pot-shaped membranes.

30

33. Device more particularly according to one of the preceding claims characterised by a membrane which is

side of the housing is flanged inwards at least in sections.

- 5 40. Device more particularly according to one of the preceding claims characterised by a seal which is inserted in an end circumferential ring groove of the contact bearing face and which in the installed state adjoins the membrane with pretension.
- 10 41. Device more particularly according to one of the preceding claims characterised by a damping member which is connected to a component part of the hydraulic operating system such as the master cylinder, the slave cylinder or the pressure line or is integrated in one
15 of these component parts.
- 20 42. Damping device for pressure vibrations or pressure pulsations in hydraulic systems, more particularly a hydraulic operating system for a shift and separate clutch in a vehicle, wherein the operating system comprises a master cylinder and is connected through a pressure line to a slave cylinder which activates the shift and separate clutch, wherein the damping device which is connected to the operating system comprises a
25 housing, with at least one pipeline connection and a membrane as well as a security element which forms a lift restriction for the membrane characterised in that a recess surrounded by an edge is formed in the housing to hold the membrane in front of which is mounted a
30 security element which is fixed in position.
- 35 43. Damping device for pressure vibrations or pressure pulsations in hydraulic systems, more particularly a hydraulic operating system for a shift and separate clutch for vehicles, wherein the operating system

comprises a master cylinder and is connected through a pressure line to a slave cylinder which activates the shift and separate clutch, wherein the damping device which is connected to the operating system comprises a housing, with at least one pipeline connection and a membrane as well as a security element which forms a lift restriction for the membrane characterised by a housing made from plastics which is combined with a membrane of spring steel as well as a security element of plastics or steel which encloses the membrane.

44. Damping device for pressure vibrations or pressure pulsations in hydraulic systems, more particularly a hydraulic operating system for a shift and separate clutch for vehicles, wherein the operating system comprises a master cylinder and is connected through a pressure line to a slave cylinder which activates the shift and separate clutch, wherein the damping device which is connected to the operating system comprises a housing, provided with at least one pipeline connection and a membrane as well as a security element which forms a lift restriction for the membrane characterised by a disc-like housing which is integrated together with the membrane in a pot-shaped security element.

45. Device more particularly according to one of the preceding claims characterised in that the pipeline connections are mounted within a circular outer contour of the housing.

46. Device more particularly according to one of the preceding claims characterised by a housing made of aluminium, preferably as a flow pressed part in which a membrane made of spring steel as well as a security element made of metal material are integrated.